REMARKS

Claims 1-5, 8-12, and 15-27 are pending. Claims 24-27 are added. Support for the additions may be found in the originally filed specification at page 7, line 18 – page 10, line 18. The Examiner is respectfully requested to reconsider and withdraw the outstanding rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. §103

Claims 17 and 19-22 stand rejected under 35 U.S.C. §103(a) as obvious based upon Tewfik et al. (U.S. Pat. No. 6,442,283) in view of Honsinger et al. (U.S. Pat. No. 6,287,791). This rejection is respectfully traversed.

Tewfik et al. is generally directed toward multimedia data embedding. In particular, the Examiner relies on Tewfik et al. to teach embedding hidden data in selected transform coefficients of audio data stream in the spectral domain using statistical mean manipulation. The USPTO admits that Tewfik et al. fails to disclose embedding in the linear prediction domain (Office Action dated February 5, 2004, pp. 5-7), or embedding in the cepstrum domain (Office action dated July 12, 2005, page 6, lines 13-16), especially where transformation to the cepstrum domain inherently includes a fast Fourier transform, followed by a logarithmic operation, and then an inverse fast Fourier transform.

Honsinger et al. is generally directed toward a lossless recovery of an original image containing embedded data. The Examiner does not rely on Honsinger et al. to teach embedding in the cepstrum domain or the linear prediction residue domain. Applicants further assert that Honsinger et al. do not teach, suggest, or motivate embedding in either of these domains.

Applicants' claimed invention is generally directed toward embedding in the linear prediction residue domain or the cepstrum domain. In particular, independent claim 17 recites, "transforming the received audio signal to a linear prediction residue domain; and embedding the hidden data in the linear prediction residue domain via parametric representation of the audio signal." Thus, Tewfik et al. and Honsinger et al. do not teach, suggest, or motivate all of the elements of claim 17.

The differences between Applicants' claimed invention and the art cited by the Examiner are significant. For example, the cepstrum domain separates the energy resulting from vocal chord vibration from the "distorted" signal resulting from the rest of the vocal tract. It can therefore be used to separate the excitation signal(which contains the words and the pitch) and the transfer function (which contains the voice quality). In a robust data hiding application, one important task is to find 'invariant' features to embed the data so that it can tolerate any intentional and unintentional distortions to its maximum capability. Therefore, embedding in the cepstrum domain allows the system to fight against jittering attack, which is difficult for conventional embedding methods such as those used in the art cited by the Examiner. Also, Tewfik et al.'s algorithms need perfect signal alignment/synchronization for watermark detection (col. 11, lines 23-25; col. 12, lines 16-18). In contrast, Applicants' claimed embedding domains allow tolerance of some degree of distortion without perfect synchronization. As a result, Applicant's claimed invention enjoys advantages for many applications.

Accordingly, Applicants respectfully request the Examiner reconsider and withdraw the rejection of claim 17 under 35 U.S.C. § 103(a), along with rejection on these grounds of all claims dependent therefrom.

Claims 17 and 19-22 stand rejected under 35 U.S.C. §103(a) as obvious based upon Tewfik et al. (U.S. Pat. No. 6,442,283) in view of Honsinger et al. (U.S. Pat. No. 6,287,791) and further in view of Sharma et al. (U.S. Pat. No. 6,480,825). This rejection is respectfully traversed.

Tewfik et al. is generally directed toward multimedia data embedding. In particular, the Examiner relies on Tewfik et al. to teach embedding hidden data in selected transform coefficients of audio data stream in the spectral domain using statistical mean manipulation. The USPTO admits that Tewfik et al. fails to disclose embedding in the linear prediction domain (Office Action dated February 5, 2004, pp. 5-7), or embedding in the cepstrum domain (Office action dated July 12, 2005, page 6, lines 13-16), especially where transformation to the cepstrum domain inherently includes a fast Fourier transform, followed by a logarithmic operation, and then an inverse fast Fourier transform.

Honsinger et al. is generally directed toward a lossless recovery of an original image containing embedded data. The Examiner does not rely on Honsinger et al. to teach embedding in the cepstrum domain or the linear prediction residue domain. Applicants further assert that Honsinger et al. do not teach, suggest, or motivate embedding in either of these domains.

Sharma et al. is generally directed toward detecting a recorded voice. In particular, the Examiner relies on Sharma et al. to teach the cepstrum domain used in speech detection, with wartermarking of the audio signal occurring before transformation of the audio signal to the cepstrum domain. Therefore, Sharma et al. do not teach, suggest, or motivate embedding the hidden data in the cepstrum domain.

Applicants' claimed invention is generally directed toward embedding in the linear prediction residue domain or the cepstrum domain. In particular, independent claim 1 recites, "transforming the received audio signal to one of a linear prediction residue domain and a cepstrum domain, wherein transformation of the received audio signal to the cepstrum domain includes a fast Fourier transform, followed by a logarithmic operation, and then an inverse fast Fourier transform; and embedding the hidden data in one of the linear prediction residue domain and the cepstrum domain via parametric representation of the audio signal. Thus, Tewfik et al., Honsinger et al., and Sharma et al. do not teach teach, suggest, or motivate all of the elements of claim 1.

The differences between Applicants' claimed invention and the art cited by the Examiner are significant. For example, the cepstrum domain separates the energy resulting from vocal chord vibration from the "distorted" signal resulting from the rest of the vocal tract. It can therefore be used to separate the excitation signal(which contains the words and the pitch) and the transfer function (which contains the voice quality). In a robust data hiding application, one important task is to find 'invariant' features to embed the data so that it can tolerate any intentional and unintentional distortions to its maximum capability. Therefore, embedding in the cepstrum domain allows the system to fight against jittering attack, which is difficult for conventional embedding methods such as those used in the art cited by the Examiner. Also, Tewfik et al.'s algorithms need perfect signal alignment/synchronization for watermark detection (col. 11, lines 23-25; col. 12, lines 16-18). In contrast, Applicants' claimed embedding domains allow tolerance of some degree of distortion without perfect synchronization. As a result, Applicant's claimed invention enjoys advantages for many applications.

Accordingly, Applicants respectfully request the Examiner reconsider and withdraw the rejection of claim 11 under 35 U.S.C. § 103(a), along with rejection on these grounds of all claims dependent therefrom.

NEW CLAIMS 24-27

Claims 24-27 are added. Support for the additions may be found in the originally filed specification at page 7, line 18 - page 10, line 18.

Tewfik et al. do not teach manipulation of the statistical mean to directly embed data. In particular, the statistical F test relied upon by the Examiner only teaches identifying tonal versus non-tonal features of the audio data; it does not teach embedding the data as a direct result of manipulating the statistical mean of the selected features with respect to a mean threshold as recited in new claim 24. For example, Tewfik et al. do not disclose enforcing a positive mean to carry one kind of bit, and a zero or less mean to carry another kind of bit as recited in new claim 25. Nor do Tewfik et al. teach removing the biased mean of selected transform coefficients to obtain a zero mean prior to embedding as recited in new claim 26. Nor do Tewfik et al. teach that a negative mean should not be used to carry any information when embedding in the cepstrum domain. Neither Honsinger et al. nor Sharma et al. teach the claimed subjected matter. Therefore, none of the references cited by the Examiner teach, suggest, or motivate the claimed subject matter. Accordingly, Applicants respectfully request the Examiner allow claims 24-27.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests

that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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